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Status of pollution and oyster culture in the York River

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by

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INTRODUCTION

The condition of the oyster industry in the York River, Virginia, has been the subject of heated controversy for some years. Complaints date back to establishment in 1914 of a pulp mill at West Point, about 25 miles upstream of the point at which the river enters Chesapeake Bay. Since that time recurrent complaints have arisen, not that oysters have been killed by the effluents, but that their quality is poor, and yields from plantings have been low.

In the mid-1930's dissatisfaction with York River oyster production increased, and Congress appropriated funds for a scientific investigation, which continued from 1935 to 1940. The final report, published in 1947[2], concluded that pulp-mill wastes are harmful to oysters, and that pollution with such wastes was the principal cause of declining productivity of oyster bars in the York River. The Chesapeake Corporation, operators of the mill, not convinced that the federal government scientists were interpreting their findings correctly, conducted scientific investigations of their own, and also inaugurated an extensive oyster-growing operation which continued until the early part of World War II. As a result of these activities, the Corporation has concluded that oysters of good quality can be grown in the York River, and that several other factors of natural origin, not investigated thoroughly by the federal government group, affect oysters on certain grounds in the York River, and adequately explain the poor quality of oysters on these grounds.

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[1] Virginia Fisheries Laboratory, Special Scientific Report No. 15. 14 January 1958.

[2] Galtsoff, Paul S., Walter A. Chipman, Jr., James B. Engle, and Howard N. Calderwood. 1947. Ecological and physiological studies of the effect of sulfate pulp mill wastes on oysters in the York River, Virginia. U. S. Dept. Interior Fish and Wildlife Serv., Fishery Bull. 43: 57-186.

Recent recurrence of organized complaints by oystermen to the State Water Control Board has prompted a re-examination of published information and results of more recent studies by the Virginia Fisheries Laboratory. It was brought out at hearings before the Water Control Board in 1955 that the only detailed report available was published by the U. S. Fish and Wildlife Service in 1947 (loc. cit.), and that no comprehensive account of investigations of the Chesapeake Corporation had appeared. As a result, the Corporation prepared a report which it released in August 1955[3]. The main points made by this report are that low salinities, turbidity, and siltation can fully explain poor oyster condition in the York, and that the Federal investigators disregarded the effects of these factors in their studies. An additional argument is that in the past 15 years recovery of mill wastes has been vastly improved, and the components cited by Galtsoff et al as most harmful to oysters have been almost entirely eliminated.

At the request of the State Water Control Board the reports by Galtsoff et al and by Evans and Dozier were reviewed carefully by biologists at the Virginia Fisheries Laboratory, and by several biologists experienced in oyster research in other states along the Atlantic coast. The present report therefore is a compendium of the interpretations of several well-qualified scientists, making use of all information available.

PRESENT CONDITION OF YORK RIVER OYSTER GROUNDS

Though oysters in the York River are sometimes of poor quality compared with those in other important growing areas in Virginia, this is not true of all localities or in all seasons. A commonly-used method of recording condition or "fatness" of oysters employs the ratio $\frac{100 \times \text{dry weight in grams}}{\text{Volume of shell cavity in ml}}$. The index for samples of Virginia oysters varies from 4 to 12; below 6 is considered poor, above 8 is good. The index in each locality varies seasonally, reaching a minimum in September or October and a maximum in May or June. Condition also varies considerably from year to year. In late May and early June 1937 the index for York River oysters ranged from 5.9 in the Poropotank area to 8.3 below Gloucester Point (Galtsoff et al, 1947). Recent investigations have shown a seasonal variation in the vicinity of Gloucester Point from 4.8 to 9.0, and on a poor ground in the upper river, near Queens Creek, from

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[3] Evans, G. L. and E. L. Dozier. 1955. A report to the Virginia State Water Control Board on the progress made in the reduction of mill effluents combined with a statement of causes of primary importance affecting the York River oyster industry. West Point, Virginia, August 1955: 104 pp.

3.9 to 6.5. The best ever observed in this River was about 9.5 off the mouth of Aberdeen Creek, a condition that would be considered excellent by any standards.

One characteristic by which the York differs from other rivers is in the success of setting on natural cultch as compared with set on shell in galvanized wire bags. Test bags characteristically catch more spat than natural cultch, probably because they project well above bottom, but whereas in the James and Rappahannock Rivers shell on the bottom may catch one-eight the numbers that strike in test bags, in the York the discrepancy usually is much greater, sometimes as much as 50-fold. Excessive silting of cultch in the York may be the cause. Because drills are abundant in the lower York and bottoms are muddy and soft farther upstream, conditions are generally unsatisfactory for setting and survival of young. Nevertheless, setting is better than in the Rappahannock, though poorer than in the James, and some planters regularly obtain commercially-useful sets in the upper York.

EFFECT OF SULPHATE PULP-MILL WASTES ON OYSTERS

Though the two groups of investigators drew contradictory sets of conclusions from their observations and experiments, it is necessary to assume that both were sincere in their interpretations of the situation. It is only proper, however, to place considerable confidence in the report of Galtsoff et al, for most of their conclusions were well-documented with details of procedures and experimental results. There is little reason to doubt the conclusions they drew regarding the effect of mill wastes upon ciliary action and other activities of oysters, but they failed to demonstrate that these harmful effects were present on oyster grounds. Satisfactory studies of the dilution and dispersion of mill wastes in the York River have not been made. The Evans report, on the other hand, relies far more on subjective interpretations, and presents details neither of experiments conducted by the Chesapeake Corporation nor of their oyster-growing operations.

The Chesapeake Corporation has greatly improved its waste-treatment facilities, and the wastes now being discharged into the river are no longer comparable, either in concentration or in composition, to those released 15 or 20 years ago. Therefore it must be recognized that conclusions drawn on the basis of conditions existing at that time are no longer valid. But complaints of poor oysters in the York River arise periodically, and wastes are still being discharged.

EFFECTS OF NATURAL CONDITIONS ON FATNESS OF OYSTERS

The most forcible argument presented by Evans and Dozier was that a number of factors of natural origin also affect oyster condition. This is obvious from the simple consideration that a natural seasonal cycle of variation of some magnitude occurs in the course of a year. It is a weakness of the Galtsoff report that natural causes were not investigated thoroughly. Major emphasis in the Corporation report was placed on the effects of siltation upon oysters, and their oyster cultural operations were designed to prove that oysters of good quality can be grown in the York River if the effects of silting are eliminated. Galtsoff has pointed out that the site of Sea-Rac operations was in the lower River, where conditions were more favorable, and this is a valid criticism. But there remains the record of the York River Oyster Corporation, which now operates, as a profitable enterprise, the grounds purchased by the pulp mill, said to include about 95 per cent of ground under lease in the 1930's. Evans and Dozier suggest that most recent complaints have come from planters who lease marginal ground, which is not good oyster bottom, and most of which had never been used before for planting.

The York River differs also from the James and Rappahannock in the extent to which the upper grounds are subject to effects of freshets. Low salinity can affect oyster condition directly by interfering with feeding, and excessive exposure to fresh water can cause mortality. The importance of salinity in the York River in relation to oyster condition requires more study. From knowledge of conditions in other areas it appears that production of market oysters on the shallower beds above Allmondsville would be hazardous because of salinity conditions alone.

Recent work at the Virginia Fisheries Laboratory has shown that Dermocystidium, the fungus disease of oysters, is prevalent on most grounds in the York River, a fact unknown at the time of previous investigations. Death rates of adult oysters in trays at Gloucester Point have varied from 20 to more than 50 per cent per year, mostly from the effects of this disease. Galtsoff estimated an annual death rate of 10 per cent and concluded that mortality rates of 35 per cent in trays of oysters held by the Chesapeake Corporation were excessive. He suggested defective experimental techniques or conditions deleterious to oysters. This conclusion cannot be accepted in view of this new knowledge. Furthermore, evidence is accumulating that the disease has a pronounced effect upon oyster condition, and thus probably contributes to poor quality of the York River crop, especially in the lower part of the river.

CONCLUSIONS AND RECOMMENDATIONS

Oysters grown in the York River are said to be of poorer quality than those from most other Virginia waters. Pollution by wastes from the pulp mill of the Chesapeake Corporation may be the cause, but it has never been proven that harmful concentrations of wastes reach oyster grounds. Several other unique conditions of natural origin exist in the River, any of which may have deleterious effects upon oysters. At the present level of knowledge it is impossible to say which factor or factors are responsible, or to be certain that a real problem exists.

Obviously, if the question is to be settled, it must be investigated much more thoroughly. Since the mill has improved its method of waste treatment and now puts out less-concentrated effluents with much of the harmful components removed, the effects of these altered wastes upon oysters should be determined and their dilution by fresh water runoff and tidal action measured accurately. More detailed studies of salinity changes in the upper river should be made, and the oysters and oyster grounds should be compared with those in other regions where similar salinity conditions prevail. Studies of changes in condition associated with salinity changes also would be valuable. The history of leasing of ground in the River also might show where good and poor grounds are, and whether recent complaints are coming primarily from newly-leased areas. The question of silting and turbidity in the York River, and the relation these factors bear to growth and condition of oysters, also require investigation.

An adequate investigation would require greater effort than was expended in studies of 20 years ago, and hence would be beyond the present resources of the Virginia Fisheries Laboratory. It is not at all certain that a clear-cut answer satisfactory to all parties could be obtained, but this in itself should not be a deterrent. As matters now stand, there is certainly not enough evidence to exonerate the pulp mill completely, and every effort should be made not only to maintain present levels of waste treatment but to improve them. Wastes of any description discharged into our tidal waters must change the characteristics of those waters in some fashion, and thus affect their biological productivity.